American Museum Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N. Y. 10024

NUMBER 2324 JUNE 19, 1968

Oligocene Rodents (Mammalia) from East Mesa, Inner Mongolia[1]

By Mary R. Dawson[2]

INTRODUCTION

The early Tertiary record of rodents in Mongolia and China is remarkably uneven. Until a few years ago no Eocene rodents had been reported, although now late Eocene ischyromyids,[3] a sciuravid, and two distinctive rodents of somewhat uncertain familial status, *Tsinlingomys* and *Advenimus,* are known (Li, 1963; Dawson, 1964) from Inner Mongolia and China. Early Oligocene rodents have also been rare. Only *Ardynomys,* coming from Ardyn Obo beds of Outer Mongolia (Mongolian Peoples' Republic), has been reported from deposits that are fairly firmly established as early Oligocene in age. The only other reported rodent possibly of early Oligocene age is *"Cricetodon" schaubi.* This interesting rodent, known from two lower molars from Yuan-Chü-Hsien, Shansi, China (Zdansky, 1930, pp. 10–12), comes from deposits of either late Eocene or early Oligocene age. This paucity of rodents in the Eocene and early Oligocene contrasts sharply with their taxonomic diversity and abundance of individuals known from middle Oligocene deposits of Hsanda Gol, Outer Mongolia, where at least

[1] Publications of the Asiatic Expeditions of the American Museum of Natural History, Contribution No. 162.

[2] Section of Vertebrate Fossils, Carnegie Museum, Pittsburgh, Pennsylvania.

[3] Throughout this paper the family Ischyromyidae is used in the sense of Black (1968) to include the Paramyidae of Wood, 1962.

eight genera occur, and from the somewhat younger Taben-buluk deposits of China, from which at least seven genera are known.

To this uneven record some new occurrences can now be added, based on specimens collected in 1928 by the Central Asiatic Expedition in lower Oligocene deposits in the vicinity of East Mesa, east of the Shara Murun River in Inner Mongolia. Four taxa of rodents appear to be present, consisting of one previously known genus, one new genus, and two other inadequately represented taxa.

I am grateful to Dr. M. C. McKenna for the loan of specimens described here, to Drs. McKenna and L. B. Radinsky for discussion of Central Asian Tertiary mammals and stratigraphy, and to Dr. C. C. Black for discussion of rodent relationships. Mr. Donald Rodkey prepared the illustrations. This study was supported by a grant from the Marsh Fund, National Academy of Sciences, and Grant GB-4089 from the National Science Foundation.

LOCALITY AND AGE

Two localities in the vicinity of East Mesa have produced the rodents reported here. Most of the specimens came from Jhama Obo, but one is from Twin Oboes, a few miles northwest of Jhama Obo. In both localities the fossil rodents came from deposits termed "Ulan Gochu," although these deposits cannot be definitely correlated with the type Ulan Gochu west of the Shara Murun River (Radinsky, 1964, pp. 9–11). Contemporaneity of "Ulan Gochu" deposits at Jhama Obo and Twin Oboes is indicated by the occurrence in both of such forms as *Desmatolagus vetustus, Gobiolagus andrewsi, Anagale gobiensis,* and one small rodent described below.

In the present state of knowledge, age determination for these localities cannot be very precise (Radinsky, 1964, pp. 7–11). Previous work on the Ulan Gochu Formation has suggested its age to be early Oligocene; the age of the "Ulan Gochu" beds at East Mesa is probably within the early Oligocene also. Burke (1941, p. 22) considered evidence from lagomorphs to indicate that the "Ulan Gochu" beds at East Mesa, although early Oligocene in age, are older than the early Oligocene deposits of the Ardyn Obo horizon. This study of rodents does not yield much information that can be used in correlation. The species of *Ardynomys* from Jhama Obo does seem to be different from that of Ardyn Obo and the Ulan Gochu Formation near Baron Sog Mesa, but this difference does not prove a younger or older age for the "Ulan Gochu" beds. The designation of early Oligocene for the "Ulan Gochu" beds is retained here, but more precise correlation is not attempted.

SYSTEMATIC DESCRIPTIONS

ORDER RODENTIA

FAMILY ISCHYROMYIDAE

Hulgana ertnia,[1] new genus and new species

TYPE SPECIMEN: A.M.N.H. No. 26085, right jaw with incomplete incisor and M_{1-3}.

HYPODIGM: Type, and A.M.N.H. Nos. 26058, 26059, incomplete right jaws with broken M_{1-3}; 26060, incomplete left jaw with M_{1-2}; 26086, incomplete left jaw with P_4–M_2; 26087, 26088, partial right maxillae with P^4–M^2; 26100, partial right jaw with M_{1-3}.

HORIZON AND LOCALITY: Lower Oligocene, "Ulan Gochu" beds; Jhama Obo, East Mesa, Inner Mongolia (field no. 674, Central Asiatic Expedition, 1928).

GENERIC AND SPECIFIC CHARACTERS: Large rodent, with dental formula $\frac{1}{1}\frac{0}{0}\frac{2}{1}\frac{3}{3}$. Cheek teeth basined and relatively simple in structure; essentially no hypocone; conules indistinct; lacking styles, stylids, and hypolophid. P^4–M^2 having anterolingual protrusion of protocone with crests converging on protocone. P_4–M_3 with prominent metaconid. Lower incisor convex ventrally and laterally. Masseteric fossa of jaw extending forward to line below talonid of M_2 or between M_2 and M_3.

DESCRIPTION: Although upper and lower jaws referred to this species were not found directly associated, their association is indicated by a similarity in size, good occlusal relationship between the upper and lower teeth, and their presence in the same deposit.

Maxilla and Jaw: Nothing more than fragments of the maxilla are preserved in A.M.N.H. Nos. 26087 and 26088, but the former specimen shows the base of the anterior zygomatic root (fig. 1). The root extends laterally as a nearly horizontal process of bone, the anterior wall of which is inclined only slightly upward. The process may have been similar to that in such protrogomorphs as *Ischyromys* and *Aplodontia,* and the infraorbital foramen was probably relatively a little lower and slightly wider transversely than in a form such as *Thisbemys.*

Although most of the jaws are somewhat crushed, the general picture that can be put together from them is of a jaw that is deep dorsoventrally but not massive and thick (fig. 2A). The mental foramen occurs below the diastema in a line slightly anterior to P_4 and above the middepth of the jaw. The masseteric fossa is shallow and has its convex

[1] From Mongol: *Hulgana,* mouse, and *ertni,* ancient.

anterior edge in a line below the talonid of M_2 or between M_2 and M_3.

Upper Teeth: Neither maxilla has P^3 preserved, but both show its presence by an alveolus that is good-sized, indicating a fairly well-developed P^3. The known upper teeth, P^4–M^2, are similar in having a prominent protocone, paracone, and metacone, with crests from the buccal cusps leading to the protocone (fig. 1). The protocone is well forward, and the crests leading to it give to each tooth an appearance

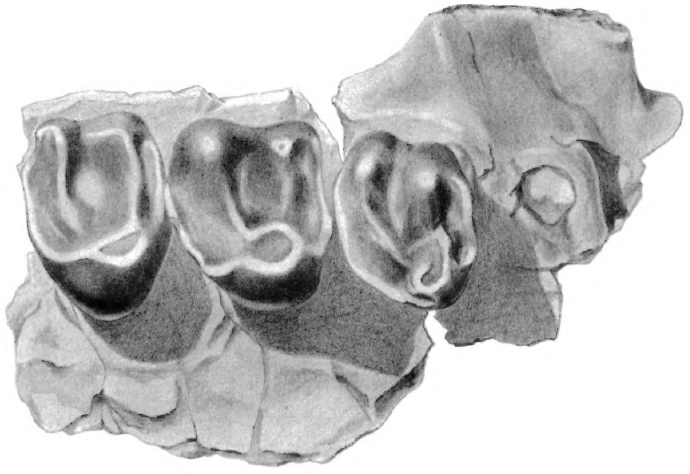

FIG. 1. *Hulgana ertnia,* A.M.N.H. No. 26087, right maxilla with P^4–M^2. Occlusal view. ×5.

of anterolingual twisting. No distinct conules are present, and there are no other crests. The fourth premolar is shorter anteroposteriorly than M^{1-2} and has a metacone that protrudes farther buccally relative to the paracone than does the metacone on the molars. On P^4 there is no trace of a hypocone, and the anterior cingulum is less shelflike than on M^1. Both M^1 and M^2 are slightly expanded posterolingually in the area where a hypocone would appear. There is, however, no sign of a discrete hypocone. The anterior cingulum is more expanded anteroposteriorly on M^1 than on M^2. Anterobuccally M^2 seems to be reduced slightly as opposed to the more quadrate shape of M^1. The last molar is not preserved in either maxilla.

Lower Teeth: In cross section the lower incisor (fig. 2B) is convex ventrally and laterally, reaching its greatest width at about the midpoint of the lateral side. The enamel extends about one-third of the way up the medial side and slightly more than one-half of the way up

the lateral side. Its shape suggests that the incisor was not a very effective chisel.

Like the upper cheek teeth, those of the lower jaw are very simple (figs. 2C, 3). The protoconid, metaconid, hypoconid, and entoconid are all marginal in position, arranged around a large central valley. The metaconid is by far the most prominent cusp. A poorly developed ectolophid is present, having on it only a slight trace of a mesoconid. The premolar is slightly smaller than M_1, and has a distinct, well-separated

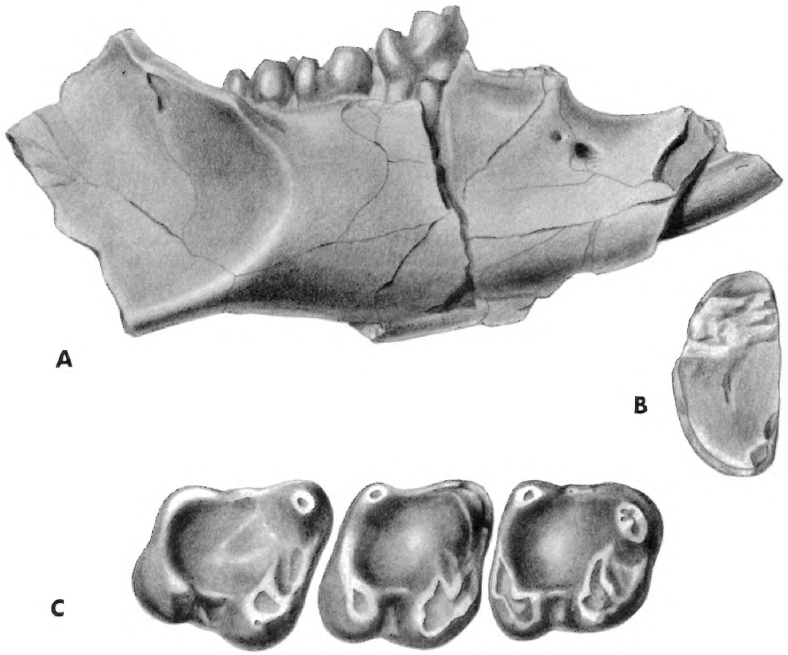

FIG. 2: *Hulgana ertnia*, type specimen, A.M.N.H. No. 26085, right jaw with M_{1-3}. A. Lateral view of jaw. ×2.5. B. Cross section of incisor. ×5. C. Occlusal view of teeth. ×5.

protoconid and metaconid, between which three small cuspules fill the anterior exit of the trigonid valley. The lower molars are somewhat rhomboidal in shape, being slightly extended in an anterolingual direction. A small rounded hypoconulid occurs on the posterolophid of unworn M_3, but otherwise the posterior cingulum is a simple, narrow ridge connecting to the small entoconid. The talonid of M_3 is narrower than the trigonid, but this is a well-developed tooth in general, anteroposteriorly longer than M_1 or M_2.

RELATIONSHIPS: *Hulgana ertnia* displays a peculiar combination of simple characters with an unusual, specialized development of the protocone and lophs of P^4 and the upper molars. Non-progressive characters of this rodent include: position of the masseteric fossa of the jaw; basined, non-crested lower cheek teeth; a weak ectolophid; the absence of well-developed conules; a narrow lower incisor; the dental formula complete for a rodent. Morphological specialization, as far as known, seems to be limited to the peculiar anterior position of the protocone of P^4–M^2 and the slightly rhomboidal shape of M_{1-3}. Some of the simple features might be derived from very primitive ischyromyids,

FIG. 3. *Hulgana ertnia,* A.M.N.H. No. 26086, left jaw with P_4–M_2. Occlusal view of teeth. ×5.

such as *Franimys* and *Paramys excavatus,* but the reduced conules and protocone specialization are unique to *Hulgana.* How many of the simple features of *Hulgana* are persistently primitive and how many might be reductions from an ancestral condition cannot be determined in the absence of known precursors.

The tendency in *Hulgana* toward anterior torsion of the protocone and somewhat rhomboidal shape of the lower molars is suggestive of similar developments in *Prosciurus* and some sciurids. In both *Prosciurus* and the oldest sciurids, however, the masseter insertion on the jaw has moved forward to below M_1 (Black, 1963, p. 143; 1965, pp. 5, 19–20). *Hulgana* shows none of this specialization, which reflects its less-advanced zygomasseteric structure. In *Prosciurus* the cheek-tooth pattern is more complicated than in *Hulgana* in having well-developed conules on P^4–M^3, a distinct anteroconid on P^4, and hypolophids on P_4–M_3. In the dentition, *Hulgana* differs from early sciurids, such as *Protosciurus condoni* (Black, 1963, pp. 139–143), in having stronger crests converging on the more anteriorly situated protocone, a less prominent entoconid, and in lacking mesostyles and mesostylids.

In masseteric structure, as far as known, and in dentition, *Hulgana* appears to be a somewhat aberrant member of the Ischyromyidae,

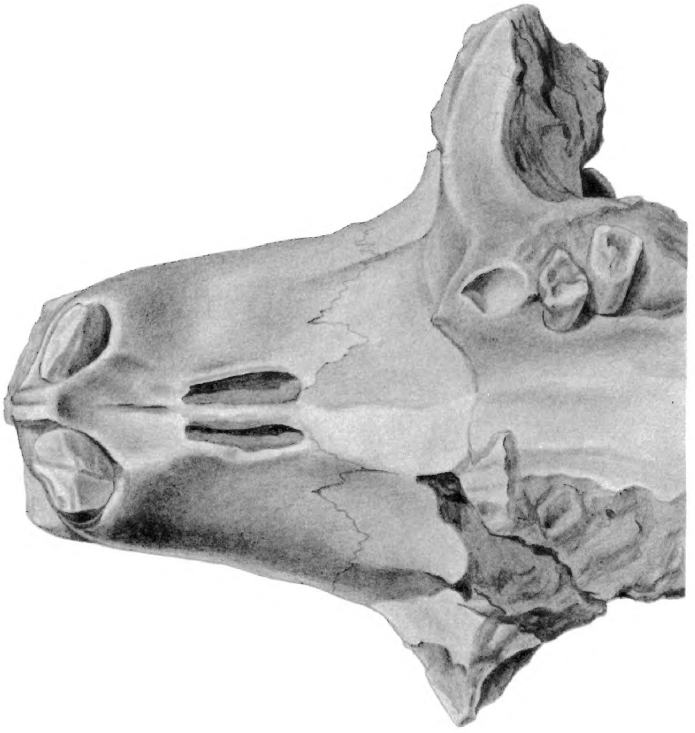

FIG. 4. ?Ischyromyid, A.M.N.H. No. 26084, partial skull. Ventral view. ×3.

which retained a generally primitive level in jaw and cheek teeth but developed a peculiar, somewhat sciurid-like anterior torsion of the protocone. This dental specialization seems to have been accomplished without the accompanying advance in zygomasseteric structure that characterizes sciurids and appears to be only a parallel, and not very closely parallel, dental development. Nor is *Hulgana* especially closely allied to *Prosciurus,* which had developed its own dental and masseteric characters by the early Oligocene. Unfortunately the incomplete Eocene and early Oligocene record of Central Asian rodents shows no earlier ancestors for *Hulgana,* and even the better-known later Asian record shows no close relatives of this form, which must be regarded as a representative of a distinct and presently isolated ischyromyid line.

FAMILY ?ISCHYROMYIDAE

SPECIMEN: A.M.N.H. No. 26084, partial skull with broken roots of teeth; lower Oligocene, "Ulan Gochu" beds; Jhama Obo, East Mesa.

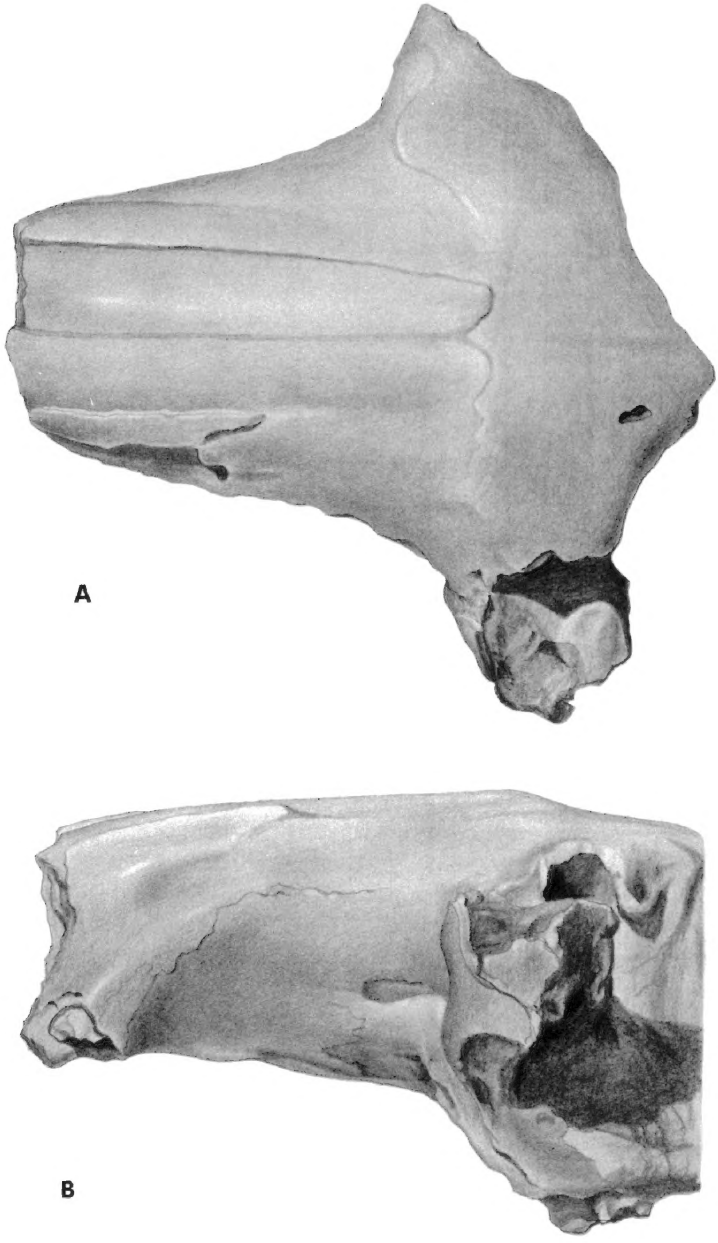

FIG. 5. ?Ischyromyid, A.M.N.H. No. 26084, partial skull. A. Dorsal view. B. Lateral view. ×3.

TABLE 1

MEASUREMENTS (IN MILLIMETERS) OF FOUR SPECIMENS OF *Hulgana ertnia* AND ONE SPECIMEN OF *Ardynomys* SP.

	Hulgana ertnia				*Ardynomys* Sp.
	A.M.N.H. No. 26087	A.M.N.H. No. 26088	A.M.N.H. No. 26085	A.M.N.H. No. 26086	A.M.N.H. No. 26077
P^4					
Anteroposterior	3.5	3.9	—	—	—
Width	4.6	4.8	—	—	—
M^1					
Anteroposterior	4.4	4.1	—	—	—
Width	4.8	4.8	—	—	—
M^2					
Anteroposterior	3.9	3.7	—	—	—
Width	5.0	5.2	—	—	—
P_4					
Anteroposterior	—	—	—	3.9	—
Width of trigonid	—	—	—	3.4	—
Width of talonid	—	—	—	3.9	—
M_1					
Anteroposterior	—	—	4.2	3.7	3.1
Width of trigonid	—	—	4.0	3.8	—
Width of talonid	—	—	4.3	3.9	3.4
M_2					
Anteroposterior	—	—	4.3	3.9	3.3
Width of trigonid	—	—	4.4	4.1	3.3
Width of talonid	—	—	4.2	—	3.4
M_3					
Anteroposterior	—	—	4.8	—	—
Width of trigonid	—	—	4.6	—	—
Width of talonid	—	—	3.6	—	—
Width of lower incisor	—	—	2.3	—	—

This woefully inadequate specimen (figs. 4, 5) represents a rodent different from the others now known from the early Oligocene of East Mesa. It is smaller than *Hulgana* and closer to *Ardynomys* sp. (below) in size. The skull, however, seems not to represent *Ardynomys* or probably any cylindrodontid. The rostrum is too long to be associated with the jaw of *Ardynomys,* and the alveoli suggest that M^3 was elongated posteriorly, a feature not found in cylindrodontids generally. Two premolars were present, P^3 having had a sturdy root and P^4 extending farther lingually than M^1. The incisor is sturdy, wide transversely, and has a nearly flat anterior surface. The attachment of the masseter muscle seems to have been on and below the strong ventrolateral ridge on the

zygoma and not anterior to the zygoma. The infraorbital foramen is small and somewhat flattened dorsoventrally.

The inadequate material suggests that this was a protrogomorph rodent, although even that cannot be firmly established, lacking a jaw. It is tentatively here regarded as an ischyromyid, an assignment based mostly on lack of evidence to the contrary.

FAMILY CYLINDRODONTIDAE

Ardynomys sp.

SPECIMENS: A.M.N.H. Nos. 26076, left jaw with M_3 unerupted; 26077, right jaw fragment with M_{1-2}; lower Oligocene, "Ulan Gochu" beds; Jhama Obo, East Mesa.

The cylindrodontid *Ardynomys* was originally described from the Ardyn Obo Formation of Outer Mongolia. Two species, *A. olseni* and *A. chihi,* were differentiated (Matthew and Granger, 1925, pp. 5–7), mainly on the basis of size. The type specimen of *A. chihi* represents a young individual having dP_4 in place. There may be some question as to whether the two named species are valid or whether their differences are merely due to difference in individual age. Two previously unreported jaws, A.M.N.H. Nos. 22108 and 22109, from Ulan Gochu beds 4 miles north of Baron Sog Lamasary (Central Asiatic Expedition, 1925) extend the Asian range of the genus into Inner Mongolia. These jaws appear referable to *A. olseni.* In addition, the above two specimens from Jhama Obo represent a species of *Ardynomys.*

The somewhat worn molars of A.M.N.H. No. 26077 are smaller than those of *Ardynomys olseni* and slightly larger than those of *A. chihi.* A small buccal cuspule, absent from *A. olseni* and *A. chihi,* occurs in the valley between the protoconid and the hypoconid on each tooth, and the hypoconid does not hook anteriorly so much as in *A. olseni.* Only slight hypsodonty is developed, as in *A. olseni.* The pattern of M_{1-2} is that typical of slightly worn teeth of *Ardynomys,* with the elements of the trigonid united by wear but the hypolophid and posterolophid distinct from each other. The pattern of the unerupted M_3 of the immature individual represented by A.M.N.H. No. 26076 shows that it, too, represents *Ardynomys.*

The smaller size of the teeth of A.M.N.H. No. 26077, as well as the buccal cuspule and the shape of the hypoconid, suggests that this Jhama Obo form may be specifically distinct from *Ardynomys* of Ardyn Obo and Baron Sog Mesa. The incomplete material does not allow a specific designation to be made for it at this time.

FAMILY INDET.

SPECIMENS: A.M.N.H. No. 26096, right jaw fragment with broken and worn M_{1-3}; lower Oligocene "Ulan Gochu" beds; Jhama Obo, East Mesa. A.M.N.H. No. 26078, edentulous right jaw fragment; lower Oligocene "Ulan Gochu" beds; Twin Oboes, East Mesa.

These two similarly sized jaws (A.M.N.H. No. 26096, depth of jaw at M_1, *ca.* 6.2; length of M_{1-2}, 3.7) may represent the same kind of rodent. Their fragmentary condition offers few details, but both jaws have a well-developed ridge ventral to the masseteric fossa that curves anterodorsally and reaches forward to a line below the trigonid of M_1. The broken, worn teeth of A.M.N.H. No. 26096 show little except that on M_2 the posterolophid protrudes posteriorly and is separate from the hypolophid. A broken root shows that P_4 was present. In cross section the incisor is very slightly convex ventrally and laterally and is widest at about its dorsoventral mid-point, although of nearly uniform width for most of its dorsoventral extent.

The well-developed, anteriorly extended masseteric ridge and the separation of the hypolophid and posterolophid indicate that this is not an ischyromyid, and the former character indicates that it is not a cylindrodontid. A trend toward anterior migration of the masseteric fossa and ridge occurred in various late Eocene and early Oligocene rodents, including the late Eocene Inner Mongolian genus *Advenimus* (Dawson, 1964). Such a progressive trend, which occurred in several lines of rodents, cannot be used for the establishing of relationships, and the affinities of this small rodent are uncertain.

REFERENCES

BLACK, C. C.
1963. A review of the North American Tertiary Sciuridae. Bull. Mus. Comp. Zool., Harvard, vol. 130, no. 3, pp. 109–248.
1965. Fossil mammals from Montana. Part 2. Rodents from the early Oligocene Pipestone Springs local fauna. Ann. Carnegie Mus., vol. 38, art. 1, pp. 1–48.
1968. The Oligocene rodent *Ischyromys* with a discussion of the family Ischyromyidae. *Ibid.*, vol. 39, art. 18, pp. 273–305.

BURKE, J. J.
1941. New fossil Leporidae from Mongolia. Amer. Mus. Novitates, no. 1117, pp. 1–23.

DAWSON, M. R.
1964. Late Eocene rodents (Mammalia) from Inner Mongolia. Amer. Mus. Novitates, no. 2191, pp. 1–15.

LI, CHUAN-KUEI
1963. Paramyid and sciuravids from North China. Vertebrate Palasiatica,

vol. 7, pp. 151–160.

MATTHEW, W. D., AND WALTER GRANGER

1925. New creodonts and rodents from the Ardyn Obo Formation of Mongolia. Amer. Mus. Novitates, no. 193, pp. 1–7.

RADINSKY, L. B.

1964. Notes on Eocene and Oligocene fossil localities in Inner Mongolia. Amer. Mus. Novitates, no. 2180, pp. 1–11.

WOOD, A. E.

1962. The early Tertiary rodents of the family Paramyidae. Trans. Amer. Phil. Soc., new ser., vol. 52, pp. 1–261.

ZDANSKY, OTTO

1930. Die alttertiären Säugetiere Chinas nebst stratigraphischen Bemerkungen. Palaeont. Sinica, ser. C, vol. 6, pp. 1–87.